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The relationship between exposure to adverse life events in childhood and adolescent years and subsequent adult psychopathology in 49,163 adult prisoners: a systematic review

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Abstract

There is empirical support for an association between childhood adverse life events and psychopathology in adult offenders. This systematic review aims to summarise the literature that measures the predictive value of childhood adverse life events on mental illness and personality disorders in prisoners in custody. Forty-seven studies were identified. The studies examined a total of 49,163 participants (36,055 males, 13,108 females). The number of offenders in each study ranged from 43 to 16,043. Childhood abuse and neglect were primarily examined. There was support that these subtypes of childhood adverse life events are associated with several psychiatric disorders, in particular substance abuse and psychopathy. Additionally, there were differences across male and female prisoners both in terms of the numbers of studies that looked at specific psychopathologies, and the associations between specific childhood adverse life event subtypes and future psychiatric difficulties. Methodological considerations, future research, and clinical implications are discussed.

Highlights

- This systematic review synthesises data of 49,163 participants from 47 studies
- Childhood abuse and neglect were the most examined form of adverse life events.
- Personality and mood disorders were assessed most in males and females respectively
- Childhood adverse life events were associated with substance use and psychopathy.

Keywords

Prison; childhood adverse life events; personality disorder; psychopathy; mental illness; gender differences; systematic review

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None to declare

1. Introduction

Childhood adverse life events that occur before the age of eighteen can damage neurobiological and neuroendocrine systems and have been shown to influence behavioural, emotional, social, physical, and cognitive development (Bremner & Vermetten, 2001; Carr, et al., 2013; Middlebrooks & Audage, 2008; Norman, et al., 2012). A growing body of research from animal and human studies suggests that the neurobiological and neuroendocrine damage can be long term, affecting a multitude of brain pathways (Anda, et al., 2006; Kim, et al., 2017; Nemeroff, 2016; Shonkoff, et al., 2012). In line with these findings, community and general population studies have established a strong link between the role of childhood adverse life events and subsequent mental health difficulties in adulthood (Bagley & Ramsay, 1986; Briere & Runtz, 1988, 1990; Conaway & Hansen, 1989; Fergusson, et al., 2008; Kilcommons & Morrison, 2005; Malinosky-Rummell & Hansen, 1993; Walsh, et al., 2010). Recent meta-analyses and systematic reviews have evidenced associations between childhood sexual abuse, physical abuse, emotional abuse, and neglect with symptoms of mood, anxiety, psychosis, and personality disorders (Carr, et al., 2013; Lindert, et al., 2014; Maniglio, 2010; Nanni, et al., 2011; Norman et al., 2012; Read, et al., 2005; Varese, et al., 2012); however, some meta-analyses have emphasised the complex association of childhood adverse life events and adult psychiatric difficulties, noting it is ultimately underpinned by both environmental and genetic risk factors (Carr et al., 2013). Other review articles have also highlighted methodological issues with the empirical studies examined (Bendall, et al., 2008). Thus, this paper will systematically review the relationship between childhood

adverse life events that occur before the age of 18 and subsequent adult psychiatric disorders in prisoners.

1.1 Prisoners: an at-risk sample

One population of individuals at risk of being exposed to childhood adverse life events is that of prisoners (Abram, et al., 2004; Baglivio, et al., 2014; Dierkhising, et al., 2013). Compared to their non-offending peers, juveniles and adults with histories of offending behaviour are more likely to come from low-income families (Barnes, 2013; Miller & Barnes, 2013), and have a low IQ (Barnes, 2013; Brewer-Smyth, 2004; Miller & Barnes, 2013; Rappaport & Thomas, 2004). Additionally, poor parent-child relationships - i.e. one characterised by harsh discipline and coercive interactions - is related to childhood delinquency (Fonagy, 2004; Keijsers, et al., 2011; Rappaport & Thomas, 2004; Scarpa, 2003). In the UK, a report by the Ministry of Justice (2012) indicated that in a sample of approximately 1,400 prisoners, 29% reported having experienced childhood sexual, physical or emotional abuse, 41% had witnessed violence as a child, 37% had a family member found guilty of a crime, 27% had a family member with a drug or alcohol problem and 24% had spent time in care at some point during their childhood. Prevalence rates of childhood adverse life events are consistently higher in prison populations than in community samples; a recent study indicated that the prevalence of childhood adverse life events (including witnessing domestic violence, and/or experiencing abuse and neglect) in a population of over 64000 American juvenile offenders was higher than comparatively examined populations, with 50% of the offender population having experienced four or more childhood adverse life events compared

with only 13% of college-educated adults (Baglivio et al., 2014). Community population rates of childhood adverse life events across high, middle and low-income countries are consistently lower, with physical abuse rates ranging from 5.3-10.8%, sexual abuse rates ranging from 0.6-2.4%, and neglect ranging from 3.6-5.2% (Kessler, et al., 2010).

Prison populations are not only more likely to have experienced childhood adverse life events, but also to have high rates of neurobiological problems that are associated with the development of psychopathology, such as reduced functioning in the prefrontal cortex, amygdala, hippocampus, and anterior cingulate. Deficits in these areas have been linked to problems in social behaviour, emotion processing and emotion regulation (Blair, 2005; Hoptman, 2003; Mitchell & Beech, 2011; Raine, 2002; Wilson & Scarpa, 2012) and have been implicated in the presentation of a range of mental illnesses and personality disorders (Davidson, et al., 2002; Garety, et al., 2007; Goodman, et al., 2004; Keshavan, et al., 2005; Marcin, & Nemeroff, 2003). Unsurprisingly, there is consistent evidence that prisoners have high rates of psychiatric disorders and substance abuse, with estimates of approximately one in seven prisoners diagnosed with psychosis or clinical depression and up to 60% of prisoners abusing substances (Fazel, et al., 2016; Fazel et al., 2006).

There has been increasing interest in examining outcomes in this at-risk population of prisoners. An expanding evidence base has highlighted an association between exposure to childhood and adolescence adverse life events and subsequent offending behaviours (Dallaire, 2007; Farrington, 2000; Malvaso, et al., 2016; Teague, et al.,

2008; Wilson, et al., 2009). Several studies have observed the impact of childhood adverse life events on psychopathology in prisoners examining a range of adverse events, such as childhood sexual abuse and childhood physical abuse, as well as a variety of clinical difficulties, for example anxiety, depression and psychopathy (Borja & Ostrosky, 2013; Fondacaro et al., 1999; Poythress, et al., 2006; Wolff & Shi, 2012). Research addressing the long term psychopathological sequelae of childhood adverse life events in prisoners has many advantages. Firstly, the higher prevalence of childhood adverse life events amongst prisoners, and its association with a wider range of other features than in community samples, suggests that prisoners provide a unique sample with the potential for improving understanding through research. Secondly, because the results of such research can result in improvements in the range of available options for societal prevention, and the subsequent management and treatment of any arising disorders. There is also the potential to impact more broadly upon reoffending behaviour. Thirdly, research with prisoners can provide data to generate hypotheses about the mechanisms behind the relationship between childhood adverse life events and psychopathology; for example, through social learning, whereby dysfunctional family relationships model to children that anger and aggression are appropriate ways to deal with stressors (Bandura, 1978; Delsol & Margolin, 2004; Wareham, et al., 2009). Neurobiological findings have extended this idea, suggesting that childhood adverse life events can foster the development of psychopathology in vulnerable individuals through the way it acts on specific regions of the brain (Fallon, 2013; Young & Widom, 2014). Lastly, gaining a better understanding of these relationships can direct future research in this relatively under-researched area.

1.2 Aims

To date several studies have been conducted that have examined the relationship between childhood adverse life events and subsequent psychiatric impact in adult prisoners. To our knowledge, no systematic review has been conducted that examines this topic. Thus, the aim of this review is to examine the relationship between childhood adverse life events that occur before the age of eighteen and subsequent adult psychiatric disorders in prisoners. The study also seeks to identify what aspects of childhood adverse life events have been examined as well as what areas of subsequent adult psychiatric disorders have been explored.

2. Methodology

2.1 Search strategy and selection criteria

A search strategy was registered with the International Prospective Register of systematic reviews (Prospero: CRD42016054266). Database searches were conducted using PsychInfo, PsychArticles, Web of Science, Google Scholar, and Social Policy and Practice for English-language, peer-reviewed journal articles presenting original data on mental illness and/or personality disorder in adult prisoners who had experienced childhood adverse life events before the age of eighteen. There were no limitations regarding publishing date.

Search terms were customised to each database. The search criteria were: “Child* abuse” OR “physical abuse” OR “sexual abuse” OR “psychological abuse” OR “emotional abuse”, “neglect*” OR “trauma*” OR “child* advers*” OR “adolescen* advers*” OR “child* maltreat*” OR “adolescen* maltreat*” OR “bully*” OR “bullied” OR “peer problem*” OR “child* victim*” OR “adolescen* victim*” OR “expressed emotion” OR “communication deviance” OR “parental loss” OR

“separat*” OR “discriminat*” AND "mental illness" OR "psychosis" OR "psychotic" OR "PTSD" OR “post-traumatic stress disorder” OR “axis I” OR “depression” OR “mood disorder” OR “anxiety” OR “substance*” OR "psychopath*" OR “personality disorder” OR “axis II” AND “Adult offend*” NOT (“juvenile offend*” OR “adolescent offend*”). The childhood adverse life events search terms were based upon those used by Varese and colleagues (2012). Psychopathology search terms were based on pre-existing reviews of community samples that used diagnostic criteria (e.g. Carr et al., 2013; Trotta, et al., 2015).

2.2 Inclusion and exclusion criteria

Studies were included in the review if:

- (i) the study examined the relationship between childhood adverse life events (occurring before the age of 18 years) and an operationalisation of adult mental illness and/or personality disorder (occurring after the age of 18 years);
- (ii) the participants were prisoners aged 18 years or older;
- (iii) the study was a piece of published empirical quantitative research.

Articles were excluded if:

- (i) there was insufficient information so that the methodology of the study and the results could be extracted;
- (ii) the paper was a review, case study, qualitative study or discussion article;
- (iii) the sample consisted exclusively of psychiatric inpatients, i.e. those detained in a forensic hospital;
- (iv) the paper was not available in English.

2.3 Data extraction and synthesis

Titles and abstracts were reviewed manually and the full text was retrieved for those papers that met the inclusion criteria or those in which eligibility was not clear. All papers that appeared to meet the criteria were reviewed for inclusion and data extraction. Reference lists were checked for additional papers.

The methodological quality of each study was assessed using the Quality Assessment Tool for Quantitative Studies (QATQ: Thomas, et al., 2004). The QATQ rates studies across six general domains: selection bias, study design, confounders, blinding, data collection, and withdrawals. Studies are coded as being methodologically ‘strong’, ‘moderate’ or ‘weak’ across the six domains. A global categorisation based on the rating of the domains is also scored. All the studies were quality assessed by the first author, and independently co-rated by the last author, disagreements were resolved by consensus.

A systematic review of assessment tools rated the QATQ as one of the best tools available (Deeks, et al., 2003). It has been used in numerous mental health and violence-related studies, including research involving individuals who have experienced childhood adverse life events (Moeller-Saxone, et al., 2014), measures of domestic violence (Arkins, et al., 2016), interventions to prevent youth violence (Atienzo, et al., 2017) and mechanisms associated with the onset and maintenance of psychosis (Valmaggia, et al., 2016).

2.4 Grouping outcome measures

Across the papers identified, several types of childhood adverse life events and psychopathologies were measured. Most studies used operationalised definitions of childhood sexual abuse, childhood physical abuse, childhood emotional or psychological abuse, childhood neglect, and a cumulative measure of childhood trauma (cumulative trauma). A smaller number of studies looked at any other types of trauma. Consequently, studies were evaluated according to childhood sexual abuse, childhood physical abuse, childhood emotional abuse, childhood neglect, other trauma and cumulative trauma. In terms of adult mental illness and personality disorders, a range of disorders were examined across the studies. Disorders were grouped according to common psychiatric terminology (from ICD-10 and DSM-V); anxiety, mood, psychosis, antisocial personality disorder (antisocial PD), borderline personality disorder (borderline PD), psychopathy, and substance use. Other personality disorders were examined by a small number of studies, and so a combined 'other PD' grouping was used. Additionally, dissociative experiences were examined by several papers, therefore a separate grouping was used to describe those studies' results.

3. Results

3.1 Study selection

Figure 1 illustrated the selection of relevant studies. The literature search yielded 6,592 articles. Removal of duplicates and screening of the title and abstract left 76 studies for full text screening. Twenty-nine papers did not meet the eligibility criteria (seventeen papers used a maltreatment variable that included incidents that occurred when the participant was older than 18 years old, seven studies did not use a prison-incarcerated population, three papers did not include inferential statistics

regarding the maltreatment-psychopathology relationship, and two studies had insufficient information about the participants to determine whether the study met eligibility criteria).

-- Figure 1 --

3.2 Sample characteristics

The studies that are included are described in Table 1. In total 49,163 participants were examined. These consisted of 36,055 males and 13,108 females, which is reflective of the overall global difference in male and female prison population numbers (Walmsley, 2015). The number of offenders in each study ranged from 43 to 16,043. Nine (19%) studies had sample sizes of less than 100 (Burcak Tasoren, 2017; Chen & Guetta, 2015; Cima et al., 2008; Dietrich, 2003; Hill & Nathan, 2008; Jenks, 2010; Schimmenti et al., 2015; Zlotnick, 1997, 1999), and eight (17%) studies had sample sizes of more than 1000 offenders (Debowska & Boduszek, 2017; Marotta, 2017; McClellan et al., 1997; Mullings et al., 2002, 2004; Roberts et al., 2008; Roxburg & MacArthur, 2014; Wolff & Shi, 2012). The studies were undertaken in fourteen different countries, with the largest contribution from USA (31 studies or 66%), followed by Canada, Turkey and UK (two studies each). The studies were published between 1996 and 2017, with over two-thirds of the studies taking place in the last ten years, indicative of a growing interest in this field. Two studies used a sample of sexual offenders (Graham, 1996; Graham et al., 2012), and one study used a sample of violent, but not sexual offenders (Hill & Nathan, 2008). The remaining forty-four studies included mixed-offending participants or did not

list the offence types. Eighteen studies focused on male offenders, twenty studies examined females, and nine studies had both male and female participants.

-- Table 1 --

3.3 Most commonly reported types of childhood adverse life events

As previously noted, community prevalence rates of childhood adverse life events in World Mental Health surveys carried out across high, middle and low-income countries indicate that physical abuse rates range from 5.3-10.8%, sexual abuse rates range from 0.6-2.4%, and neglect range from 3.6-5.2% (Kessler, et al., 2010). Although prevalence rates of childhood sexual abuse tend to be lower than other forms of abuse in both community and prison populations (Finkelhor, et al., 2015; Friestad, et al., 2014; Levenson, et al., 2014; Stoltenborgh, et al., 2015), it was the most measured form of adversity in this review, suggesting a general skew in this direction. Forty-five studies in this review included a measure of it either alone or as a combined trauma variable. Childhood physical abuse was also examined in a high number of studies, with forty studies including it in their data analyses. Cumulative trauma, an aggregate measure of multiple types of trauma, was examined by thirty studies. However, the term cumulative trauma had a number of different definitions across the studies, including the presence of more than one type of trauma (Akyuz et al., 2007; Chen & Gueta, 2015; Cima et al., 2008; Graham et al., 2012; Greene et al., 2014; Loper et al., 2008; Poythress et al., 2006; Saavedra & Alvarez, 2013; Schimmenti et al., 2015), childhood physical and sexual abuse (Graham, 1996; Kennedy et al., 2013; Kennedy et al., 2016; Tripodi & Pettus-Davis, 2013; Zlotnick,

1997; 1999), number of childhood traumas (Greene et al., 2014), and severity of childhood trauma (Driessen et al., 2006).

Childhood emotional abuse, neglect, and other forms of childhood adverse life events were examined substantially less than physical, sexual and cumulative abuse. Emotional abuse was measured by twenty-one studies, and neglect was examined by nineteen studies. Less than half of the studies in this review looked at variables other than childhood abuse and neglect. Of the small number of studies that considered other types of childhood adverse life events, parental difficulties (conflict/domestic violence, criminality, substance use, mental health and parental separation) and loss (traumatic loss or being removed from birth family) were the most looked at. Although peer relationships have been shown to influence delinquent behaviour (Watts & McNulty, 2014) as well as the development of psychopathology (Klomek, et al., 2015), they were only examined in one study (Roberts et al., 2008). Apart from considerations of cumulative trauma, many more studies examined the impact of childhood adversity on adult psychopathology amongst male prisoners than amongst females.

3.4 Psychopathology measures

In keeping with the high prevalence of personality disorders, psychopathy, mood disorders and substance abuse found in prison populations (Fazel et al., 2006; Fazel & Danesh, 2002), these disorders were measured the most across all the studies in this review. Mood disorders and psychopathy were examined the most in studies evaluating male participants, whilst mood disorders and substance use were measured the most in cohorts of female participants. Despite the consistent findings

in community studies that childhood adverse life events are robust risk factors for the development of psychosis (Bendall, et al., 2013; Gibson, et al., 2016; Varese et al., 2012), psychosis was the least examined adult psychopathology outcome across the papers included in this review.

4. Discussion

This review aimed to examine the relationship between childhood adverse life events and subsequent adult psychiatric disorders, to identify what aspects of adverse childhood adverse life events and subsequent adult psychiatric disorders have been examined in the literature, and to assess the methodological rigour of the identified studies. Forty-seven studies were identified that examined the relationship between childhood adverse life events and adult psychopathology in prisoners. In line with the research within community settings (Carr et al., 2013), most of the selected papers confirmed an association between childhood adverse life events and the presence, number or severity of adult psychiatric disorders. Only two studies did not detect any relationship (Chen & Guetta, 2015; Grella et al., 2013), and given the prison sample sizes of 50-100 participants this could be due to low power. Of note, all studies that included prevalence rates of childhood adverse life events demonstrated substantially higher rates than those seen in community samples.

4.1. Associations between childhood adverse events and psychopathology in men and women

There was considerable variation in terms of the adult psychopathology outcomes of male prisoners, although largely – with the exception of childhood sexual abuse - a history of childhood adverse life events was consistently related to substance abuse and psychopathy. Childhood sexual abuse was consistently linked to mood disorders in the four studies that measured psychiatric disorders. Also, there was some support for a link between childhood sexual abuse and a range of other mental illnesses, including dissociation, anxiety, and measures of alienation. However, there were some inconsistencies in the available literature, indicating a need for more evidence to be made available through research in this area. With childhood physical abuse, there was a consistent relationship between anxiety mood disorders, and substance abuse. There was also a possible link with a range of axis I disorders, borderline PD and psychopathy. Despite the relative dearth in studies that examined childhood emotional abuse and neglect, there were links between childhood emotional abuse and neglect with psychopathy. For cumulative trauma, there was a relationship with Axis I disorders, PTSD, substance abuse and psychopathy. All other variables indicated either inconsistent results across studies, or only one study explored that relationship (i.e. borderline PD, alienation).

In terms of other childhood adverse life events, there was tentative support for parental difficulties being related to typically antisocial PD in male prisoners. Parent substance use seems to be related to anxiety (Dietrich, 2003) substance use disorder, alcohol dependency (Marotta, 2017), and antisocial PD (Roberts et al., 2008), but not other PDs (Roberts et al., 2008) nor dissociation (Dietrich, 2003).

Parent and family mental illness was related to psychosis (Saavedra & Alvarez, 2013) and histrionic PD (Roberts et al., 2008), but not other PDs. One study found support for a relationship between parental criminality and Avoidant PD and antisocial PD, but not any other PD (Roberts et al., 2008). Parental discord, tension or violence was related to antisocial PD (Hill & Nathan, 2008; Roberts et al., 2008) and psychopathy (Borja & Ostrosky, 2013), but not other PDs (Roberts et al., 2008), nor anxiety, nor dissociation (Dietrich, 2003). Coming from a ‘broken family’ was related to antisocial PD but not borderline PD nor mood disorder (Viitanen et al., 2011).

In terms of loss, whilst traumatic loss showed no relationship with Axis I disorders (Green et al., 2014), experiencing the death of a friend was associated with future psychopathy (Borja & Ostrosky, 2013). Going into Local Authority Care was demonstrated to have a positive relationship with borderline PD and antisocial PD, but no other PD (Roberts et al., 2008), and being in foster care was related to subsequent depression (Roxburgh & MacArthur, 2014) and substance use disorder (Marotta, 2017). Being abandoned as a child was also linked to adult anxiety and depression (Wolff & Shi, 2012). Peer relationships seemed to have an impact on the development of PD in Roberts and colleagues’ study, which found that being bullied was positively related to borderline PD, Histrionic and Avoidant PD (but no other PDs), and peer criminality was positively related to subsequent antisocial PD development (but no other PDs). The same study also found that harsh discipline was related to antisocial PD development. In sum, it appears there is an emerging evidence base to suggest that other traumas may play a factor in subsequent

psychiatric problems, but this review demonstrates that this is presently a considerably under-researched area.

Studies evaluating female participants showed a similar pattern to studies which included male participants, i.e. there seemed to be a consistent relationship between childhood adverse life events and substance abuse and psychopathy; however, cumulative trauma in women seemed to be related to all types of axis I and II disorders (anxiety, PTSD, mood, ASPD, BPD, substance abuse, and psychopathy). Childhood sexual abuse was consistently linked with dissociation, substance use and psychopathy. There was also some evidence of a link with anxiety, PTSD, and psychosis; although due to the low number of studies that examined this, more research is needed. Childhood physical abuse was consistently linked to borderline PD and psychopathy, with mixed evidence for a relationship with psychosis and substance abuse. There was limited evidence for a relationship between childhood emotional abuse and adult psychopathology. There was emerging evidence for a link with psychosis and psychopathy; however more studies are needed to examine these relationships. Only eight studies examined the relationship between childhood neglect as a single variable with adult psychopathologies. There were no consistent relationships, with only mixed evidence for a link with substance abuse.

Nine papers looked at other childhood adverse life events types in female prisoners, which included: the impact of a broken family on borderline PD, antisocial PD, mood, and anxiety (Viitanen et al., 2001); the impact of witnessing parental violence and physical abuse on dissociation and PTSD (Dietrich 2003); the impact of parental substance problems on dissociation and PTSD and dissociation (Dietrich 2003; Roe-

Sepowitz et al., 2007); the impact of traumatic loss on number of current Axis I disorders (Greene et al., 2014); the impact of maladaptive family circumstances on substance use (Sharp et al., 2012); the relationship between parent substance and alcohol problems with alcohol and drug dependency (Mullings et al., 2004; 2002); the relationships between having a caretaker use alcohol and drugs, and being in foster care on adult substance use disorder and alcohol dependency (Marotta, 2017); and the impact of being in foster care and adult depression (Roxburgh & MacArthur, 2014). Living with someone or having a parent with a substance abuse problem predicted substance use disorders (Marotta, 2017; Mullings et al., 2002; Roxburgh & MacArthur, 2014) and alcohol dependency (Mullings et al., 2004), and being in foster care predicted substance use disorder (Marotta, 2017) as well as subsequent depression (Roxburgh & MacArthur, 2014). Having a mother who was battered in the home was positively related to drug use, and negatively related to alcohol use, whilst parental divorce was related to daily alcohol use only (Sharp et al., 2012). There were no other indications of support for any links between other types of childhood adverse life events and psychopathology in female prisoners; however due to the small number of studies, and because two studies included mostly male participants, more research is needed.

The finding that childhood adverse life events in both male and female prisoners is related to alcohol and drug abuse is consistent with data in non-prisoner samples. childhood adverse life events have been strongly related to heavy and binge drinking (Klanecky et al., 2012), alcohol dependence (Ducci et al., 2009), and a higher rate of illegal substance use in adulthood (Madrugá et al., 2011). Exposure to stress during childhood can cause permanent changes in brain structure and function as well as

negatively affect brain reactivity to stress (Edalati & Krank, 2016; Hart & Rubia, 2012). Changes to brain structure and function have been observed in regions associated with vulnerability for substance abuse, e.g. the cerebellar vermis (Anderson et al., 2002; De Bellis & Kuchibhatla, 2006), the prefrontal cortex (Carrion et al., 2009; Everitt & Robbins, 2005), and amygdala (Everitt & Robbins, 2005; Tottenham et al., 2010). These deficits have been hypothesised to impact on substance use through impairments in executive control over behaviour (Everitt & Robbins, 2005), difficulties problem-solving (Cooper et al., 1992), dysfunctional memory associations (Edalati & Krank, 2016), and as a means of emotion regulation (Aldao et al., 2010).

Data from this review indicated that childhood adverse life events are also linked with psychopathy. Similar to the literature regarding the relationship between maltreatment and substance abuse, neurobiological deficits have been hypothesised to mediate the childhood adverse life events-psychopathy relationship. For example, Nikulina and Widom (2014) demonstrated that poor cognitive flexibility and nonverbal reasoning mediated the relationship between childhood adverse life events and impulsive, antisocial behaviour, and manipulative psychopathic traits. Emotion recognition deficits, which are determined by amygdala dysfunction, have been shown to interact with the relationship between childhood adverse life events and psychopathic traits (Waller et al., 2017). It may also be the case that psychopathic characteristics such as lack of honesty, superficial charm, and the tendency to manipulate others could be understood in the context of coping strategies used to deal with childhood adverse life events (Krstic et al., 2016).

There was substantial variation in adversity-psychopathology relationships amongst the studies, which could be due to several reasons. Firstly, it could reflect the complex association of childhood adverse life events and adult psychiatric difficulties. There are numerous environmental and genetic risk factors for psychopathology in adulthood (Carr et al., 2013), and the participants in these studies may have several personality or genetic characteristics, or have been exposed to a wide range of adversities that have not been controlled for or examined. In fact, a small number of studies looked at mediating and moderating variables in the childhood adverse life events-psychopathology relationship and noted that childhood adverse life events alone may not lead to future psychopathology, post-traumatic stress symptoms (Greene et al., 2014) and that family mental health problems (Chen & Guetta, 2015) have a strong role in the pathway. The variation may also be due to other methodological issues, such as low numbers of studies or measurement biases that will be discussed below. However, the findings of this systematic review should be considered as emerging evidence and warrant further research.

4.2. Limitations

4.2.1. Publication bias

There are several methodological limitations of this systematic review. As Norman and colleagues (2012) noted, reviews can be subject to publication bias because non-significant findings are less likely to be published. The findings of this review may therefore over represent the relationship between childhood adverse life events and adult psychopathology in prisoners. Additionally, it is clear that most of the available research comes from high income countries, with a dearth of literature from other parts of the world. Further research should be a priority in order to

examine the links between childhood adverse life events and psychopathology in prisoners from low and middle-income countries.

4.2.2. Measurement issues

There were inconsistencies in how categories of childhood adverse life events were defined and measured across the studies. Although there were five main types of childhood adverse life events that were measured (childhood sexual abuse, childhood physical abuse, childhood emotional abuse, childhood neglect, cumulative trauma), there were eighteen different trauma measures used across the thirty studies that had varying definitions of abuse. Similarly, there were nineteen different measures of psychopathology. While many studies used validated measures of trauma, seven included self-report measures of abuse. Without psychometric evaluation of a measure it is unclear whether the intended construct has been accurately assessed, making any findings hard to interpret. There were also difficulties with the validated measures of abuse. For example, the Life Experiences Questionnaire assesses actual physical contact within their sexual abuse measure, while the CTQ includes “someone threatened to hurt me or tell lies about me unless I did something sexual with them” within the category. In some studies, abuse was recorded only if a family member was the perpetrator whilst in other studies any person could be the abuser. Additionally, while both childhood sexual abuse and childhood neglect were measured as one variable in most studies, a small number of studies looked at separate variables of emotional neglect, physical neglect, penetration, and other sexual acts. These variations in measurement make comparisons between studies problematic. Also, because some studies only consider abuse when it was perpetrated by a family member, there is likely to be an under-reporting of abuse (i.e.

from those individuals who were abused by other people). The difficulty of defining and measuring childhood adverse life events has been described in other studies (Browne, et al., 1999; Cicchetti, 1989; Finkelhor, 1994; Loper et al., 2008; Mash, & Wolfe, 1991; Norman et al., 2012).

Finally, meta-analyses have several benefits over systematic reviews (see Grewal et al., 2017; Rosenthal & DiMatteo, 2001). However, given the different measurements of adversity and psychopathology, a meta-analysis could not be conducted. Harmonising the protocols across studies including measurement tools in future studies would allow this statistical approach to be taken.

4.2.3. Study design

All the studies included retrospective reports of childhood adverse life events, and many used self-report measures of trauma and psychopathology. As outlined by Briere (1992), this can cause difficulties. Due to the retrospective (and for many studies, correlational) character of the studies it can be hard to determine cause and effect. While it could be assumed that the childhood adverse life events predates adult psychopathology, current distress/symptomology may impact on the respondent's retrospective reports of childhood adverse life events. However, as Bendall and colleagues (2008) note, a prospective study of childhood adverse life events would be an ethical challenge because the detection of child abuse would require it being reported, which would change the natural trajectory of abuse and its sequelae.

While most studies controlled for a range of socio-demographic and study design variables, a few studies presented unadjusted associations between childhood adverse life events and health outcomes, or adjusted for age and sex only. Additionally, although a small number of papers looked at the role of moderators and mediators in the relationship between childhood adverse life events and adult psychopathology (Greene et al., 2014), most did not. Previous research in community populations has highlighted several important factors that seem to be related to better or worse adaptation to childhood adverse life events. These factors include self-esteem, locus of control, attributions of blame, peer relationships, and coping strategies (Cicchetti, et al., 1993; Lynskey & Fergusson, 1997; McGee, et al., 2001). Future studies should ensure that confounders and co-variables are adequately and appropriately considered in offender models.

A final design limitation of some of the studies involved potential selection bias. Recruitment procedures were not always adequately described, and when prisoners declined to participate it was reportedly challenging to document differences between the samples. This questions how representative the prison sample was in each case.

4.3. Future directions for research

The review highlights the current focus on a small range of childhood adverse life events and psychopathology variables. Primarily childhood physical, sexual and cumulative abuses were examined in this prisoner population, with very few studies looking at any other type of childhood adverse life events. There is evidence from community samples that both problematic parental relationships and bullying during

childhood are associated with future psychiatric difficulties (Enns, et al., 2002; Sourander, et al., 2007, Arseneault, 2017). Given that healthy and sustained peer and parental relationships may be few in prison populations (Chambers, et al., 2000), it would be useful for other areas of childhood adversity to be more widely examined in this group.

Despite its high prevalence amongst prison populations (Shaw, et al., 2009), psychosis was under-examined compared to the other disorders. For studies evaluating males, it was examined once in relation to childhood sexual abuse, other trauma, and cumulative trauma. It was not examined at all in relation to childhood physical abuse, childhood emotional abuse, or childhood neglect. Although it was studied more in women, it was not examined at all in relation to childhood emotional abuse, childhood neglect or other trauma. This may be reflective of an underlying thinking that trauma is more likely to be related to future personality disorder, than to major mental illness. Antisocial personality disorder has antisocial or criminal behaviour as a key diagnostic criterion, making it a diagnosis for which most prisoners qualify. The nature of some prison environments is such that they may promote aggressive behaviour as a component of self-protection as an understandable response to being threatened or coerced. Therefore, some such individuals may, on superficial examination, appear to meet the criteria for antisocial personality disorder, their behaviour being to some extent dependent upon the context in which they are detained. Additionally, the organisational structure of the country's correctional services, including the extent to which mental health care is integrated, may also play a key role in determining research priorities. The bias of studies conducted in high income regions and the research priorities of those

countries, might also have impacted upon the under- and overrepresentation of specific psychopathologies. However, given that a link has been established between psychosis and childhood adverse life events in community populations (Carr et al., 2013; Read et al., 2005; Varese et al., 2012), it would be useful to investigate this area closely amongst prison populations that are known to have particularly high rates of psychotic illness (Fazel & Seewald, 2012).

As Kennedy and colleagues (2013; 2016) emphasise, mental health services in prisons are generally not designed to address the prevalent experiences of childhood victimisation. The findings in this review support a demand in the literature for the development of targeted and trauma-focused mental health and transition services for men and women (Drapalski, et al., 2009; Spjeldnes, et al., 2014). Several trauma-informed, gender-responsive, evidence-based interventions are currently being evaluated within the prison context (e.g. Wolff, et al., 2015; Zlotnick, et al., 2009). Participation in these interventions has been associated with reductions in mental health issues, as well as decreases in recidivism.

Most of the studies included in this review used samples of mixed-offending participants primarily between 30 and 40 years old from North America or Europe, as such the results can be generalised to that specific population. Exploring this issue in diverse populations (e.g. in different countries, age groups, offending types) is positive in terms of furthering our understanding of childhood adverse life events and its long-term effect on adults in different contexts. Variation in the terminology was used across the studies, which is reflective of the heterogeneity within the group of individuals in contact with the criminal justice system. In general terms,

‘offenders’ can also include people serving community sentences, while ‘prisoners’ also includes non-offenders who are on remand (pre-trial) and therefore innocent because they have not yet been found guilty. Further research in examining the pathway from childhood adverse life events to adult psychopathologies within specific subgroups would be invaluable.

It is also important to highlight that this systematic review examined psychopathology in the context of diagnostic categories. While this approach has demonstrable efficacy (Hofmann & Smits, 2008) and has been widely used in the empirical literature (Carr et al., 2013; Fazel & Danesh, 2002; Trotta et al., 2015), there are also weaknesses. Firstly, there is strong evidence indicating that different psychopathologies have similar aetiological and maintenance processes and share many similar genetic, familial, and environmental risk factors (Kendler, 1996). For example, in a large-scale survey of over 34,000 US adults Keyes and colleagues (2012) found that childhood adverse life events impacted on underlying liability levels to internalising and externalising psychopathology rather than specific psychiatric disorders. Secondly, current and lifetime comorbidity amongst mental disorders is high (Brown, et al., 2001), particularly among individuals with forensic histories (Ogloff, et al., 2004). Driven by these concerns there is a growing consensus to move away from the single diagnosis approach towards a transdiagnostic conceptualisation of mental disorders (Barlow, et al., 2016; Newby, et al., 2015). Poor emotion regulation is one transdiagnostic risk factor that has been implicated in many psychological disorders, including mood, anxiety, eating, substance use, and personality disorders (Aldao, et al., 2010; Naragon-Gainey, et al., 2017). Additionally, there is growing evidence that childhood stressors predict

emotion regulation neural functions in adulthood (Kim, et al., 2013). Future research could consider the impact of childhood adverse life events on transdiagnostic symptoms generally and the development of emotion regulation difficulties specifically.

5. Conclusion

This review of 47 studies found evidence that childhood adverse life events is associated with a range of psychiatric disorders in adulthood, and that these associations vary across gender. The findings highlight the importance of disruptive experiences early in development on subsequent functioning during adulthood. Most of the studies in this review were published in the last ten years, indicating that this area of study is increasing in interest; however, there are still low numbers of papers in this area, with some disorders not being examined in relation to childhood adverse life events at all (e.g. childhood emotional abuse and psychosis). Future studies could consider looking at the impact of other types of childhood adverse life events, as well as building upon the results of the studies within this systematic review. Given the heterogeneity within this group, it is crucial that sufficient coverage is provided so that adequate inferences can be made and generalised to the wider population. Finally, there is a clear need for psychosocial treatments that address the sequelae of childhood adverse life events in this at-risk group. Systems should be in place to ensure that childhood adverse life events are routinely inquired about (Brooker & Webster, 2017). Governments should ensure that mental health services provided to prisoners are of an appropriate standard (Exworthy, et al., 2012) and that they include access to psychological therapies including trauma-informed interventions (Forrester, et al., 2014).

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Figure 1: PRISMA Flow Diagram

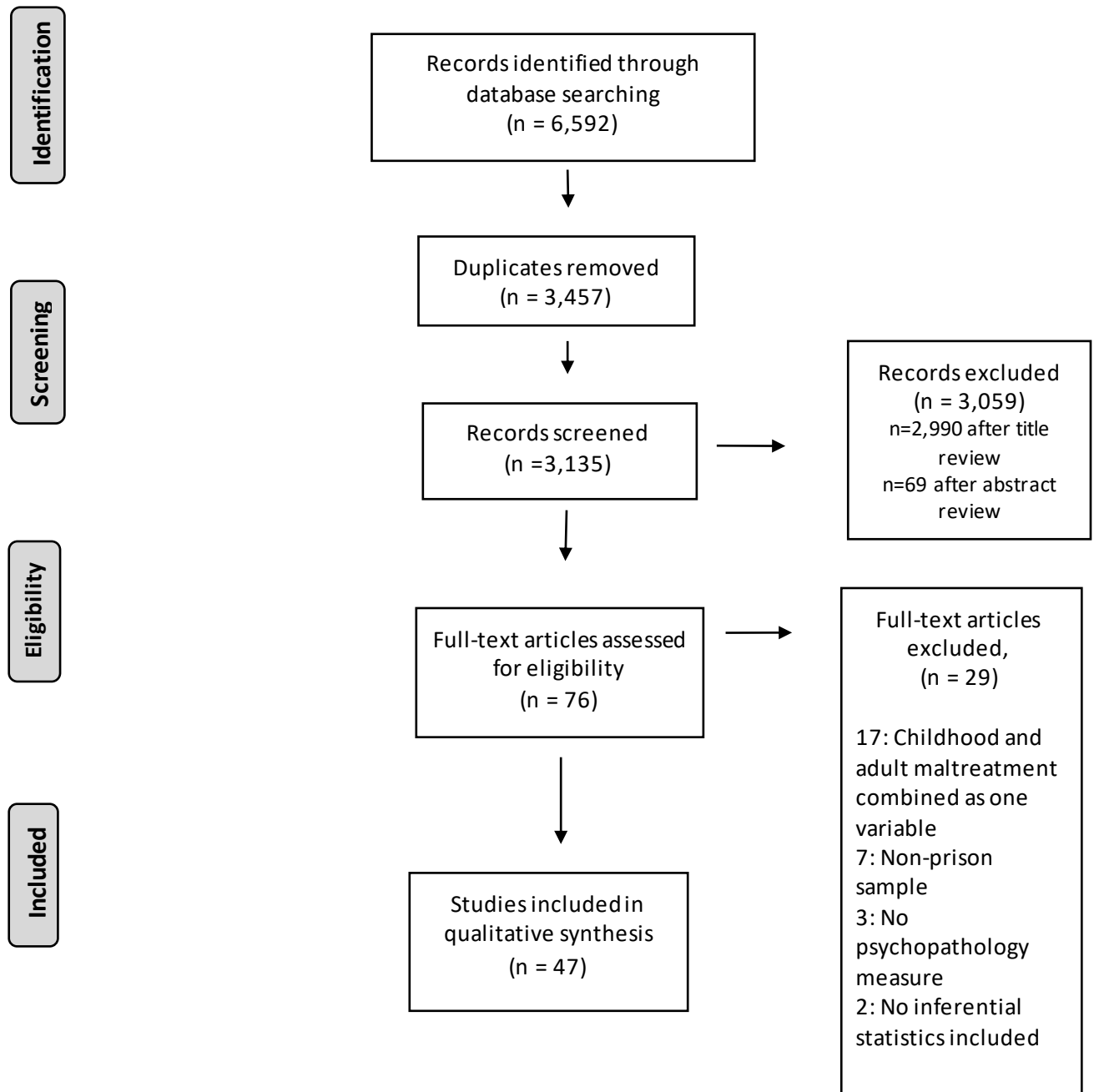


Table 1. Characteristics of studies identified by review sorted by gender of participants and psychopathology measured (mental illness only, both mental illness and PD, and PD only).

Study	Country	Final sample	Mean age (SD, range)	Type of offending	Child maltreatment measure	Psychopathology measure	Main findings	QATQ global rating
Studies evaluating males only								
Akyüz <i>et al</i> (2007)	Turkey	108	36.4 (12.5, 19-68)	Mixed offending, maximum security	Childhood Abuse and Neglect Questionnaire (CANQ)	Dissociative Experiences Scale (DES)	Dissociation significantly related to CSA, not CN, CEA, CPA or CT Trauma frequency: CPA=34.3%, CN=22.2%, CEA=16.7%, CSA=3.7%	Moderate
Graham (1996)	Canada	286	Not given	Sex offenders, minimum security	Self-report	DES Minnesota Multiphasic Personality Inventory (MMPI)	Both CPA and CSA, and CSA groups report more alienation than no abuse. CPA by both parents have higher level of dissociation than those abused by father or mother alone Trauma frequency: CSA=70%, CPA=50%	Weak
Saavedra and Alvarez (2013)	Spain	472	37.15 (10.3, 18-76)	Mixed offending, prison	Self-report	Structured Clinical Interviews for DSM-IV Axis I disorder (SCID I)	CT associated with psychosis and drug-related psychosis, but not depression or anxiety Trauma frequency: witnessing violence=40.5%, serious accident=40.5%, CN=9.5%, CSA=4.8%, CSA and CPA=4.8%	Strong
Wolff and Shi (2012)	USA	3986	33.3 (10.1)	Mixed offending, maximum, medium, and minimum security	Self-report	Self-report	CPA associated with depression and anxiety treatment. CSA associated with depression treatment and symptoms, and anxiety treatment and symptoms. Being abandoned associated with depression treatment and symptoms, and	Weak

							anxiety symptoms Trauma frequency: CPA=44.7%, CSA=10.9%, CPA and CSA=9.6%	
Zgoba <i>et al.</i> (2013)	USA	654	56.85 (5.99, 50-82)	Mixed offending, prison	Life Stressors Checklist- Revised	PTSD Checklist-CV (PCL-CV)	PTSD related to CSA with and without penetration Trauma frequency: CSA (without penetration)=21.6%, CSA (with penetration)=17.6%	Moderate
Fondacaro and Holt (1999)	USA	211	32 (18-63)	Mixed offending, jail and prison	Self-report	Diagnostic Interview Schedule Version III- R (DSM-III-R)	CSA related to lifetime schizoaffective disorder, lifetime and current depression, lifetime and current PTSD, lifetime panic disorder, lifetime generalised anxiety disorder, lifetime obsessive compulsive disorder, and ASPD. CSA not related to schizophrenia, bipolar or dysthymia Trauma frequency: CSA=40.4%	Moderate
Hill and Nathan (2008)	UK	54	29.16 (5.74)	Violent, not sexual, offenders, prison	Childhood Experiences of Care and Abuse (CECA)	Structured Clinical Interviews for DSM-IV Axis II disorder (SCID II)	ASPD associated with parental tension, not CSA, CPA, CN, or domestic violence. Conduct disorder mediates ASPD- parental tension relationship Trauma frequency: CPA=65%, parent tension=43%, domestic violence=28%, CN=24%, CSA=15%	Moderate
Roberts <i>et al.</i> (2008)	UK	1396		Mixed offending, prison	Self-report	SCID I and II	CSA associated with histrionic PD and BPD. CEA associated with obsessive-compulsive and schizoid PD. CN associated with avoidant, obsessive-compulsive PD. Emotional neglect associated with paranoid PD and ASPD. Family mental health associated with histrionic PD. Harsh discipline associated with ASPD. Family criminality associated with avoidant PD and ASPD. Parental discord associated with ASPD. LAC associated with BPD and ASPD. Criminal peers associated with ASPD. Being bullied associated with avoidant, histrionic PD and BPD	Moderate

							Trauma frequency: harsh discipline=77.7%, criminal peers=70.9%, parental discord=61.7%, criminal family=55.3%, LAC=32.2%, emotional neglect=27.3%, bullied=26.7%, family mental health problems=19.8%, CEA=17.6%, CN=12.2%, CSA=6.8%	
Borja & Ostrosky (2013)	Mexico	194	Low= 38.7(10.6), medium= 32.3 (9.1), high psychopathy= 32.6 (8.6)	Mixed offending, maximum security	Early Trauma Inventory Short Form (ETI)	Psychopathy Checklist-Revised (PCL-R)	High psychopathy positively related to CT. Psychopathy also related to CPA, CEA, CSA, domestic violence, death of peer, illness/hospitalisation, and accidents/injuries Trauma frequency for whole sample not provided	Weak
Cima <i>et al.</i> (2008)	The Netherlands	47 prisoners, 27 UGs	Prisoners 30.4 (9.72), UG 24.9 (8.56) – age controlled	Healthy undergraduate control Mixed offending, prison	Childhood Trauma Questionnaire (CTQ)	Psychopathic Personality Inventory (PPI)	Psychopathic offenders report less physical neglect than non-psychopathic offenders. No differences for CEA, CSA, CPA or emotional neglect Trauma frequency not reported	Moderate
Dargis <i>et al.</i> (2016)	USA	183	18-55	Unspecified offending type, medium-secure prison	CTQ	PCL-R DSM-5 criteria	CT, CPA, physical CN, CEA, and emotional CN significantly associated with PCL-R total. No relationship for CSA. Number of ASPD symptoms were significantly associated with CPA, but not CT, CSA, physical CN, CEA, or emotional CN.	Strong
Dargis & Koenigs (2017)	USA	222	18-55	Unspecified offending type, medium-secure prison	CTQ	PCL-R	High negative affect psychopaths scored significantly higher CT, CEA, CPA, and emotional CN than the low negative affect psychopaths. No differences for physical CN or CSA.	Moderate
Debowska &	Poland	1261	34.9 (10.0)	Mixed offending,	CANQ	Psychopathic	High combined CPA and CEA had significantly lower odds of	Strong

Boduszek (2017)				maximum and medium security prisons		personality traits scale (PPTS)	scoring high on cognitive responsiveness component of PPTS compared to low abuse/neglect. High CT (all abuse types) had significantly higher odds of scoring high on cognitive responsiveness compared to high physical and emotional abuse only. Trauma frequency: CPA=54.3%, CEA=61.7%, CN=39.6%, contact CSA=4.8%, penetrative CSA=4.4%	
Graham <i>et al.</i> (2012)	USA	226	42.08 (11.1)	Sex offenders, unclear location	Review of case files	PCL-R	CSA associated with higher PCL-R total and interpersonal, lifestyle and behavioural facets. CPA associated with behavioural facet. CN associated with behavioural facet. CT related to PCL-R total. CEA not associated with psychopathy. Trauma frequency: CSA=41.7%, CPA=33.6%, CEA=17%, CN=9%	Moderate
Poythress <i>et al.</i> (2006)	USA	615	30.5 (6.2)	Mixed offending, prison or drug treatment facility	Child Abuse and Trauma Scale (CATS)	Personality Assessment Inventory (PAI) PPI PCL-R	CT associated with dissociation, PCL-R-total and PCL-R lifestyle facet. CPA associated with lifestyle PCL-R only. CEA associated with one aspect of dissociation and lifestyle PCL-R. CSA associated with two aspects of dissociation Trauma frequency not provided	Moderate
Schimmenti <i>et al.</i> (2015)	Italy	78	43.3 (10.9, 20-71)	Mixed offending, prison	Traumatic Experiences Checklist	PCL-R	CEA associated with PCL-R total, PCL-R Factor 1, PCL-R Factor 2. CEA was the only unique predictor of psychopathy. CPA associated with PCL-R Factor 2. CSA associated with PCL-R Factor 2. Trauma frequency: CEA=51.3%, CPA=46.2%, CSA=21.8%	Moderate
Burcak Tasoren (2017)	Turkey	43	19.1 (0.9, 18-21)	Mixed offending, prison	CTQ	Self-report	CT predicted drug use	Weak
Sergentanis <i>et al.</i> (2014)	Greece	173	41.9 (12.7)	Mixed offending, prison	Self-report	CAGE questionnaire Self-report	CT significantly related to higher use of alcohol, illicit substance use, and personal history of any diagnosed	Moderate

							psychiatric condition. Trauma frequency: CT=26%	
Studies evaluating females only								
Chen and Gueta (2015)	Israel	50	35 (10.5)	Mixed offending, maximum security prison	CTQ	Beck Depression Inventory-II (BDI-II)	CT, CSA, CPA, CEA, CN not associated with depression or psychiatric illness Trauma frequency: CEA=72%, CPA=62%, CN=60%, CSA=54%	Moderate
Tripodi and Pettus-Davis (2013)	USA	125	34.3 (9.94, 19-62)	Mixed offending, maximum, medium and minimum security prisons	CTQ National Violence Against Women Survey Experiences of Sexual Victimisation	Addiction Severity Index	CPA and CSA together related to psychiatric illness. CPA and CSA alone not related to psychiatric illness Trauma frequency: CPA and CSA=32.5%, CPA=20.3%, CSA=11.4%	Strong
Kennedy <i>et al.</i> (2016)	USA	230	33.7 (9.9, 18-72)	Mixed offending, maximum, medium and minimum security prisons	CTQ	Mini International Neuropsychiatric Interview (MINI)	CPA related to current psychosis, but not depression. CSA related to current depression and psychosis. CPA and CSA related to current depression and psychosis. Trauma frequency: CPA and CSA=29.5%, CSA=16.5%, CPA=9.8%	Strong
Kennedy <i>et al.</i> (2013)	USA	159	33.7 (9.71, 18-62)	Mixed offending, maximum, medium and minimum security prisons	CTQ	MINI	CPA and CSA severity related to psychosis. CPA severity and CSA severity alone not related to psychosis Trauma frequency: CPA and CSA=37%, CPA=16.2%, CSA=11.3%	Strong
Zlotnick (1997)	USA	85	31 (8.6)	Mixed offending, prison	Clinician Administered	SCID-I and II Structured Interview	CT significantly related to PTSD Trauma frequency: CT=65.9%	Moderate

					Assessment Interview for Adults	for Measurement of Disorders of Extreme Stress (SIDES)		
Grella <i>et al.</i> (2013)	USA	200 (100 prison and 100 matched controls)	21-55 prison, 21- 74 controls	Offences not described, correctional facility	Self-report	DSM-IV criteria	CT not significantly associated with PTSD. Trauma frequency (prison): any trauma in childhood=53%, witness domestic violence=43%, CN=22%, CSA=49.1%, CPA=23%, rape=33%	Moderate
Johnson & Lynch (2013)	USA	224	34.9 (9.9)	Correctional facility	Trauma History Questionnaire	PCL-CV DES	CSA prior to 14 significantly significant relationship with difficulties with emotion regulation and post-traumatic stress is mediated by self-blame. Trauma frequency: CSA before 14=63.8%, forced sexual touch=61.2%, forced sex=73.7%, attacked with weapon=78.1%, attacked without weapon=78.1%, beaten by family member=50.0%	Weak
Roe-Sepowitz <i>et al.</i> (2007)	USA	192	35.7 (9.46)	Mixed offending, correctional facility	Child Maltreatment Interview Schedule Trauma Symptom Inventory	Trauma Symptom Inventory (TSI)	Dissociation related to CSA and CPA, but not CEA or domestic violence. Only CPA predictive of dissociation Trauma frequency: CSA with penetration=72%, CSA without penetration=68%, domestic violence=57%, CPA=50%, CEA=27%	Moderate
Jenks (2010)	USA	78	36.5 (11.04, 20-62)	Mixed offending, correctional facility	CTQ	PAI	CSA related to anxiety, but not depression, ASPD or BPD Trauma frequency: CSA=53.8%	Strong
Loper <i>et al.</i> (2008)	USA	142	Cluster B 30.03 (7.78), non-	Mixed offending, high security prison	Physical Maltreatment Scale,	SCID-II	Cluster B personality disorder offenders have significantly higher reported levels of maternal and paternal maltreatment, but not CSA	Moderate

			Cluster B 33.03 (8.29)		Psychological Maltreatment Scale, Sexual Maltreatment Scale (adapted from Sexual Experiences Questionnaire)		Trauma frequency: verbal maternal maltreatment=92.3%, physical maternal maltreatment=77.5%, verbal paternal maltreatment=89.1%, physical paternal maltreatment=67.4%, CSA with penetration=29.6%	
Specht <i>et al.</i> (2009)	USA	117	33.9 (8.5)	Offences not listed, correctional facility	CTQ	SCID-II Young Schema Questionnaire	CPA, CEA and perceived lack of emotional support related to BPD symptom severity. CSA and CN not related to BPD. Rejection and Impaired Limits schemas fully mediated CT relationship with BPD.	Weak
Zlotnick (1999)	USA	85	31 (8.6)	Mixed offending, prison	Clinician Administered Assessment Interview for Adults	SCID I and II SIDES	CT significantly related to BPD, but not ASPD Trauma frequency: CT=65.9%	Strong
Kimonis <i>et al.</i> (2010)	USA	266		Mixed offending, prison or drug treatment facility	Child Abuse and Trauma Scale (CATS)	PAI PCL-R	CSA associated with anxiety, depression, ASPD, PCL-R total and PCL-R lifestyle. CPA associated with anxiety, depression, ASPD, and PCL-R lifestyle. CEA associated with anxiety, depression, ASPD, PCL-R total and PCL-R lifestyle. CT associated with anxiety, depression, ASPD, PCL-R total, and PCL-R lifestyle Trauma frequency not reported	Moderate
Hicks <i>et al.</i> (2010)	USA	226	31.9 (6.8)	Mixed offending, prison	Life Events Checklist	PCL-R	Psychopathy related to CPA, CSA, and CT. Higher proportion of secondary psychopaths experience CPA than controls. Higher proportion of primary psychopaths experienced CSA	Moderate

							than control prisoners Trauma frequency not provided	
Verona <i>et al.</i> (2005)	USA	226	31.9 (6.8)	Mixed offending, correctional facility	Self-report	PCL-R	CSA associated with PCL-R total and Factor 2. CPA associated with PCL-R total and Factor 2 Trauma frequency: CSA=33.6%, CPA=27.4%	Moderate
Erickson (2016)	USA	292	35.8 (8.1, 18-66)	Minimum security assessment and rehabilitation centre	Self-report	PAI Texas Christian University Drug Screen	Significant positive relationship between number of CT types and depression, anxiety, and borderline scores of PAI. Significant positive relationship between number of CT types and use of psychiatric medication and history of psychiatric hospitalisation. Number of CT types was significantly correlated with alcohol and drug scales of PAI. Trauma frequency: domestic abuse=46.9, CSA=37.3%, family violence=32.3%	Moderate
Mullings <i>et al.</i> (2002)	USA	1198	33	Mixed offending, Texas Department of Criminal Justice	Self-report	Self-report	Drug abusing women are more likely to report mother and father having a alcohol/drug problem, mother and father having a psychiatric problem, feeling unloved, having been left alone when they were too young, feeling unsafe, physical CN, CSA and CPA. There were no significant differences for dropping out of school.	Weak
Mullings <i>et al.</i> (2004)	USA	1198	33	Offences not stated, Texas Department of Criminal Justice	Self-report	Self-report and DSM- IV criteria	Women who were alcohol dependent were more likely to have grown up in disorganized family situations, including parental drug and alcohol use-related problems, CN, CSA, and CPA. Only CN and having a father with alcohol problems were directly predictive of adult alcohol problems	Weak
Sharp <i>et al.</i> (2012)	USA	598	36 (18-69)	Offences not stated, prison	Self-report	Self-report	CT directly related to daily alcohol use, but not daily drug use. CT indirectly related to daily alcohol and drug use through anger expression. Living with someone with a substance use	Moderate

							problem predicted daily drug use. Physical CN, CPA, and CSA were negatively predictive of daily drug use. Trauma frequency: emotional CN=69.9%, CEA=62.9%, CSA=56.3%, CPA=52.2%, physical CN=46.8%, battered mother=34.4%	
Rideout (2009)	USA	101	36.6 (10.9, 20-62)	Mixed offending, correctional facility	CTQ	PAI Self-report	CEA related to use of hallucinogens, methamphetamines, depressants, tranquilizers, and heroin. CEA also related to mental health treatment prior to- and whilst in prison. CEA did not significantly differentiate between scores on PAI (e.g. anxiety, depression, paranoia, schizophrenia, BPD, ASPD, or drug problems) Trauma frequency: CEA=74.3%	Strong
Studies evaluating males and females								
Dietrich (2003)	Canada	93 total; 62 males and 31 females	34 (9.5)	Mixed offending, correctional facility	Child Maltreatment Interview Schedule Short Form	Detailed Assessment of Posttraumatic States (DAPS) Multiscale Dissociation Inventory (MDI) Somatoform Dissociation Questionnaire (SDQ-20)	CEA associated with PTSD and two aspects of dissociation. Maternal emotional neglect associated with one aspect of dissociation. CSA (without penetration) associated with one aspect of dissociation. CSA (with penetration) associated with four aspects of dissociation and total dissociation. CPA, domestic violence, and paternal emotional neglect not associated with PTSD or dissociation Trauma frequency: CEA=69.9%, CSA (without penetration)=65.6%, CPA=64.5%, domestic violence=60.2%, CSA (with penetration)=59.1%, paternal emotional neglect=45.2%, loss of parent=28%, maternal emotional neglect=22.6%	Moderate
Greene <i>et al.</i> (2014)	USA	465 total; 284	31.7 (9.3)	Mixed offending, jail	Traumatic Events	SCID-I Clinician	Axis I disorders associated with CT, CPA and CSA. All relationships fully mediated by post-traumatic stress	Moderate

		males and 181 females			Screening Instruments (TESI)	Administered Post Traumatic Disorder Scale (CAPS)	symptoms. CEA and traumatic loss not related to Axis I disorders Trauma frequency: CPA=33.6%, CSA=21.2%, traumatic loss=19.8%, CEA=4.5%	
Roxburgh & MacArthur (2014)	USA	13,328 total; 10,710 males and 2,618 females	35.4 (10.4, 16-84)	Mixed offending, prison	Self-report	Self-report	CSA and CPA associated with depression for men and African American women, but not White or Hispanic women. Being in foster care associated with depression for all men and women, but especially women and Hispanic people. Trauma frequency: parent/guardian drug or alcohol abuse=33.6%, CPA=14.6%, foster care=12.1%, CSA=7.2%	Strong
Saxon <i>et al.</i> (2001)	USA	129 total; 124 males and 5 females		Mixed offending, jail	Life Event History Questionnaire	PCL-CV	CPA more likely to screen positive for PTSD than no PTSD. CT more likely to screen positive for PTSD than no PTSD. No difference for CN. Trauma frequency: CPA=29.7%, CN=28.9%	Moderate
Driessen <i>et al.</i> (2006)	Germany	139 total; 76 males and 63 females	34 (9.8)	Mixed offending, prison	CTQ	SCID-I and II Global Assessment of Functioning Scale General Severity Scale (GAF)	CT associated with current Axis I disorders, number of current and lifetime Axis I disorders, lifetime and current anxiety disorders, PTSD, PDs, number of PDs, Cluster B PDs, BPD, ASPD, and Cluster C PDs. No association between CT and psychosis, affective disorders, or Cluster A PDs Trauma frequency: severe emotional neglect=33.1%, severe CPA=23.7%, severe CEA=23.7%, severe CSA=9.4%, severe physical neglect=5.0%	Moderate
Viitanen <i>et al.</i> (2011)	Finland	410 total; 307 males and 103 females	34.1 (10.4) males 34.6 (10.0) males	Mixed offending, prison	Self-report	SCID-I and II Clinical medical examination ICD-10 diagnoses	Men: CPA associated with mood, anxiety, and BPD, but not ASPD. CSA associated with mood disorder, but not anxiety, BPD, or ASPD. Parents separated associated with ASPD, not BPD, anxiety or mood disorder	Strong

		females					<p>Women: CPA associated with BPD, but not ASPD, mood or anxiety disorders. CSA associated with BPD and ASPD, but not mood or anxiety disorders. Parents separated not associated with BPD, ASPD, mood or anxiety</p> <p>Trauma frequency men: parents separated=63.2%%, CPA=14.9%, CSA=7.4%</p> <p>Trauma frequency women: parents separated=63.4%%, CPA=24.8%, CSA=31.7%</p>	
Lukasiewicz <i>et al.</i> (2008)	France	998 total; 898 males, 100 females	39 (13)	Mixed offending, remand prisons, high-security prisons, and intermediate stay prisons	Self-report	MINI Cloninger's Temperament and Character Inventory	<p>Significant indirect influence of childhood mistreatment on alcohol abuse and dependence through novelty seeking temperament. Significant indirect influence of childhood mistreatment on drug abuse and dependence through novelty seeking temperament and character (maturity).</p> <p>Trauma frequency (total): childhood mistreatment=29.6%, judge seen in childhood=26.6%, separation from one parent for more than 6 months=43.6%, placed in care=22.0%</p>	Moderate
Marotta (2017)	USA	16,043 total; 12518 males, 3525 females	Not provided	Mixed offending, state and federal prisons	Self-report	DSM-IV criteria	<p>Growing up with a caregiver that used drugs or alcohol was associated with higher odds of having a substance use disorder and alcohol dependence. CPA was associated with higher risk of substance use disorders and alcohol dependence. Having spent time in foster care predicted higher risk of substance use disorder.</p> <p>CSA for women was associated with increased risk of alcohol dependence, cocaine use, crack use, injecting any drug, injecting methamphetamine, and sharing needles, but not for men.</p> <p>Men CSA were less likely to use marijuana. For men, CPA</p>	Moderate

							<p>increased risk for injecting any drug, using heroin, cocaine, and sharing needles. Foster care increased risk of injecting heroin and cocaine for men.</p> <p>Trauma frequency male: CSA=5.1%, CPA=34.8%, caretaker alcohol or drugs=32.1%, foster care=11.7%</p> <p>Trauma frequency female: CSA=27.3%, CPA=31.5%, caretaker alcohol or drugs=40.9%, foster care=12.2%</p>	
McClellan <i>et al.</i> (1997)	USA	1530 total; 1030 males, 500 females	32.8 male, 32.3 female	Mixed offending, prison	Self-report	Self-report DSM-III	<p>CT associated with adult depression for men and women, but more strongly for women. CT associated with increased risk of substance dependence, especially for women.</p> <p>Trauma frequency males: CSA=4.5%, felt unloved=25.3%, CPA=23.5%, CEA=17.7%</p> <p>Trauma frequency females: CSA=26.0%, felt unloved=40.8%, CPA=23.2%, 30.0%</p>	Weak

ASPD=antisocial personality disorder; BPD=borderline personality disorder; CSA=childhood sexual abuse; CPA=childhood physical abuse; CEA=childhood emotional abuse;
 CN=childhood neglect; CT=cumulative trauma; LAC=local authority care; PD=personality disorder; PTSD=post-traumatic stress disorder.

